Claims

1. An inband signaling modem for communicating digital data over a voice channel of a telecommunications network comprising:

an input for receiving digital data;

an encoder for converting the digital data into audible tones that synthesize frequency characteristics of human speech and prevent voice encoding circuitry in the telecommunications network from corrupting the digital data represented by the synthesized audio tones; and

an output for outputting the synthesized audio tones to a voice channel of a digital wireless telecommunications network.

2. An inband modem according to claim 1 wherein the synthesized tones are transmitted to avoid interference with actual voice signals transmitted over the same voice channel.

3. An inband modem according to claim 1 wherein the encoder includes:

a packet formatter for formatting the digital data into inband signaling packets; and

a modulator for converting bits in the inband signaling packets into the synthesized tones.

4. An inband modem according to claim 3 wherein the packet formatter appends a preamble of bits to the digital data for sacrificing to any encoding circuitry that corrupts initial tones in the inband signaling packets.

5. An inband modem according to claim 4 wherein the packet formatter appends a postamble of bits to the ends of the inband signaling packets for sacrificing to any encoding circuitry that corrupts the synthesized tones.

6. An inband modem according to claim 3 wherein the packet formatter appends a sequence of bits at the fronts of the inband signaling packets that precondition the encoding circuitry by simulating generally the sequence of synthesized tones representing the digital data.

7. An inband modem according to claim 1 wherein the encoder converts binary "1" bits in the digital data to a first tone having a first frequency within a

human voice range and converts binary "0" bits in the digital data to a second tone having a second frequency within the human voice range.

8. An inband modem according to claim 7 wherein the first and second frequency are both between 400 and 1000 Hertz.

9. An inband modem according to claim 1 where the encoder generates samples of the digital data at about 8000 samples per second and outputs the encoded audio tones representing the bits of the digital data at a rate of about 100 bits per second.

10. An inband modem according to claim 9 wherein the sequence of first and second frequencies as a continuous signal with from 5 to 15 milliseconds time periods for each binary bit in the digital data.

11. An inband modem according to claim 9 wherein the amplitude of the first and second frequencies are about 25 millivolts.

12. An inband modem according to claim 1 wherein the encoder is located in a battery pack detachably coupled to a cellular telephone.

13. An inband modem according to claim 12 including a digital to analog converter located in the battery back that is coupled to the encoder and that outputs analog signals representing the synthesized tones to the cellular telephone.

14. An inband modem according to claim 13 wherein the analog signals are fed into a same analog to digital converter in the cell phone that processes human voice signals.

15. An inband modem according to claim 1 wherein the encoder is implemented as software in a cellular telephone processor that also operates as a voice coder.

16. An inband modem according to claim 1 including a decoder for decoding the synthesized tones transmitted over the voice channel of the telecommunications network.

17. An inband modem according to claim 16 wherein the decoder includes:

a first inband filter for detecting signals outside of a synthesized tone frequency band;

a second out of band filter for detecting signals inside the synthesized tone frequency band; and

a comparator that compares the signals detected outside the synthesized tone frequency band with the signals detected inside the synthesized tone frequency band and identifies signals as synthesized tones when the compared value is greater than a selected value.

18. A modem according to claim 17 wherein the decoder includes an active state that correlates detected synthesized tones with a first audio tone representing a binary "1" value and a second audio tone representing a binary "0" value.

19. A modem according to claim 16 wherein the decoder synchronizes decoding of the synthesized tones by shifting samples of the simulated tones until a maximum power ratio is detected for a digital synchronization pattern transmitted with in the simulated voice data.

20. A cellular telephone, comprising:

an audio microphone for converting voice signals into electrical voice signals;

an analog to digital converter for converting the electrical voice signals into digital voice samples;

a voice coder for converting the digital voice samples into encoded digital voice signals;

a transceiver that transmits the encoded digital voice signals over a digital voice channel of a wireless communications network; and

an inband signaling modem that converts a digital bit stream into synthesized tones and outputs the synthesized tones to the voice coder, the voice coder encoding the synthesized tone in the same manner as the electrical voice signals before being transmitted over the digital voice channel.

21. A cellular telephone according to claim 20 including a digital to analog converter coupled between the inband signaling modem and the analog to digital converter.

22. A cellular telephone according to claim 21 wherein the inband signaling modem and the digital to analog converter are located in a device detachably coupled to the cellular telephone.

23. A cellular telephone according to claim 20 including a packet formatter that converts the digital bit stream into inband signaling packets that include sacrifice bits that can be corrupted without losing any of the content of the digital bit stream.

24. A cellular telephone according to claim 23 wherein the sacrifice bits are located at the beginning and at the end of the inband signaling packets.

25. A cellular telephone according to claim 23 wherein the packet formatter attaches a sequence of preconditioning bits to the inband signaling packets that enable the voice coder to adapt to the frequencies, bit rate and sequence of synthesized tones that represent the digital bit stream.

26. A cellular telephone according to claim 25 wherein the preconditioning bits are a random sequence of "1" and "0" binary bits.

27. A cellular telephone according to claim 20 including a decoder (16) coupled to the voice coder for detecting and decoding synthesized tones received over the digital voice channel.

28. A cellular telephone according to claim 27 wherein the decoder includes:

a first inband filter for filtering signals outside of a synthesized tone frequency band;

a second out of band filter for filtering signals inside the synthesized tone frequency band; and

a comparator that compares the signals outside the synthesized tone frequency band with the signals inside the synthesized audio tone frequency band and identifies signals as synthesized tones when the compared value is greater than a selected value.

29. A cellular telephone according to claim 28 wherein the decoder includes:

an active state that correlates detected synthesized tones with a first transform representing a binary "1" value and a second transform representing a binary "0" value;

a clock recovery state that synchronizes the decoder to the synthesized tones by first shifting samples of the synthesized tones until a maximum power ratio is detected in a digital synchronization pattern in the simulated voice data; and

a demodulation state where synthesized audio tones are demodulated back into digital data.

30. A cellular telephone according to claim 20 wherein the synthesized tones are generated at a first audible frequency to represent binary "1" values and at a second audible frequency to represent binary "0" values, the first and second frequencies being about 100 Hertz apart, each extending for a duration of about 10 milliseconds and generated as one continuous signal.

31. An inband signaling modem for communicating digital data over a digital voice channel of a wireless communications network, comprising:

an input that receives voice signals over the voice channel of the wireless communications network;

a filter that detects synthesized tones representing the digital data and is interleaved with the voice signals transmitted over the digital voice channel, the synthesized tones synthesizing frequency characteristics of human speech and preventing voice encoding circuitry in the wireless telecommunications network from corrupting the digital data represented by the synthesized audio tones; and

a demodulator that converts the detected synthesized tones back into the represented digital data.

32. An inband modem according to claim 31 wherein the filter includes:

a first inband filter for detecting signals outside of a synthesized tone frequency band;

a second out of band filter for detecting signals inside the synthesized tone frequency band; and

a comparator that compares the signals detected outside the synthesized tone frequency band with the signals detected inside the synthesized tone frequency band and identifies signals as synthesized tones when the compared value is greater than a selected value.

33. A modem according to claim 32 wherein the demodulator decoder includes an active state that correlates detected synthesized tones with a first audio tone representing a binary "1" value and a second audio tone representing a binary "0" value.

34. A modem according to claim 33 wherein the demodulator synchronizes decoding of the synthesized tones by shifting samples of the simulated tones until a maximum power ratio is detected for a digital synchronization pattern transmitted with in the simulated voice data.

35. A modem according to claim 34 wherein the modem includes an analog to digital converter for receiving signals from an digital to analog converter in a cellular telephone.

36. A modem according to claim 35 including an encoder for converting the digital bit stream into synthesized tones and outputting the synthesized tones to a voice coder in the cellular telephone.

37. Software code for communicating digital data over a voice channel of a digital wireless telecommunications network comprising:

code for forming the digital data into a packet payload in an inband signaling packet;

code for attaching preconditioning bits to the inband signaling packet that prevent circuitry in the wireless telecommunications network from corrupting the digital data;

code for converting the bits in the inband signaling packet into a series of voice frequencies that simulate characteristics of human speech; and

code for converting the simulated voice frequencies into encoded data transmitted over the digital voice channel of a wireless telecommunications network.

38. Software code according to claim 37 including code for generating a sequence of bits in a preamble of the inband signaling packet that preview the sequence of bits in the packet payload.

39. Software according to claim 37 including code that converts the synthesized voice frequencies into analog signals before sending the synthesized voice signals to a voice coder for transmission over the wire telecommunications network.

40. A method for communicating digital data over the voice channel of a digital wireless telecommunications network comprising:

receiving a digital bitstream;

encoding the digital bitstream into a continuous audio signal having different frequency tones for different bit values;

selecting the frequency tones to represent speech signals that will pass through a voice coder without being corrupted;

encoding the audio signal into encoded values with a voice coder for transmitting over the digital wireless telecommunications network; and

transmitting the encoded values over the digital wireless telecommunications network.

41. A method according to claim 40 including:

segmenting the digital bitstream into packet payloads in inband signaling packets; and

attaching preconditioning bits to the inband signaling packets that prevent circuitry in the digital wireless telecommunications network from corrupting the bits from the digital bitstream.